CHAPTER 14

Freight Transportation

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Freight Transportation

A Federal Committee established in 1944 the vision for what became the Interstate System. Its findings were documented in *Interregional Highways: Message from the President of the United States Transmitting A Report of the National Interregional Highway Committee Outlining and Recommending a National System of Interregional Highways* (78th Congress, 2nd Session, House Document 379, Committee on Roads, January 12, 1944. Page 18). One part of that vision was "...the Committee does not suggest that there is need of special highway facilities for the accommodation or encouragement of long-distance trucking. ... The probable early development of an efficient commercial air-freight service, together with the keener competition of a rejuvenated rail service, would seem to forecast a future shortening rather than lengthening of average highway-freight hauls."

Contrary to that forecast, long-distance trucking grew dramatically with the development of the Interstate Highway System. By 2002, approximately 525,000 trucks (excluding pickups, vans, minivans, and sport utility vehicles) traveled 44 billion miles on trips greater than 200 miles, according to the U.S. Bureau of the Census, *Vehicle Inventory and Use Survey, 2002.* The U.S. Federal Highway Administration (FHWA), Freight Analysis Framework indicates that trucks carried nearly 3 billion tons of goods worth over $4 trillion across state lines, representing one-fourth the weight and half the value of all goods moved by truck.

Trucking is both a critical component of the Nation's economy and a concern to the traveling public, who share increasingly crowded highways with freight-hauling vehicles. For reasons discussed in this chapter, freight is a fast-growing part of traffic on our Nation's highways. This growth affects the condition and performance of the highway system, which in turn influences the ability of trucking to deliver goods in a timely and economical manner. This chapter examines the effects of freight transportation on the performance of the highway system, the consequences of highway performance for freight movement and the Nation's economy, and some of the special investment needs of freight transportation.

The Growth of Freight Transportation

Trucking is a key element of the freight transportation system. Trucks carried 70 percent of the value and 60 percent of the tons of commodities shipped in 2002, not including shipments moved by truck in combination with another mode. (Percentages are lower than previously reported because the estimate of total shipments in the most recent Freight Analysis Framework is more complete.) The Nation's highways handled over 1.5 trillion ton-miles of commodities in 2002. The number and mileage of trucks by industry is shown in *Exhibit 14-1*.

The growth in freight transportation is spurred by continued economic growth. The growth in trucking is stimulated by additional factors, including, but not limited to, increased demand for just-in-time deliveries of lighter and more valuable goods, major reductions in railroad track mileage, and decentralization of business establishments. As shown in *Exhibit 14-2*, this growth shows no signs of abating. Freight tonnage is forecast to increase by 70 percent between 1998 and 2020, and trucking is expected to account for the majority of the projected increase.

Exhibit 14-1

Trucks, Truck Miles, and Average Miles per Truck by Major Use

Major Use	2002 Trucks (Thousands)	Percent Change from 1997 to 2002	2002 Truck Miles (Millions)	Percent Change from 1997 to 2002	Average Miles per Truck 2002 (Thousands)	Percent Change from 1997 to 2002
Total Trucks [1]	85,174.8	17.0	1,114,728.0	6.8	13.1	-8.8
For-Hire Transportation or Warehousing	1,280.2	20.8	72,272.8	-0.8	56.5	-17.9
Vehicle Leasing or Rental	859.2	59.3	20,024.6	45.9	23.3	-8.4
Agriculture, Forestry, Fishing, or Hunting	2,239.9	-38.7	24,120.0	-44.0	10.8	-8.6
Mining	177.6	-29.1	3,411.5	-27.1	19.2	2.9
Utilities	679.3	2.3	10,244.7	8.6	15.1	6.1
Construction	4,541.5	-24.7	75,906.2	-29.8	16.7	-6.7
Manufacturing	782.9	7.3	15,384.5	-9.3	19.6	-15.5
Wholesale Trade	735.9	-41.8	16,963.5	-47.7	23.1	-10.2
Retail Trade	1,530.5	-31.8	27,470.5	-31.8	17.9	V
Information Services	376.6	N	5,622.0	N	14.9	N
Waste Management, Landscaping, or Administrative/Support Services	743.2	N	10,709.3	N	14.4	N
Arts, Entertainment, or Recreation Services	187.1	N	1,784.1	N	9.5	N
Accommodation or Food Services	284.3	N	5,816.3	N	20.5	N
Other Services	2,127.3	N	35,776.2	N	16.8	N
Personal Transportation [2]	65,343.0	28.3	766,639.8	21.4	11.7	-5.3
Not Reported	1,308.2	N	20,820.7	N	15.9	N
Not Applicable [3]	1,978.0	65.8	1,761.4	646.3	0.9	350.1

KEY: N = not available; V = an estimate of less than 50 vehicles, 50,000 miles, or 0.05 percent.

[1] The VIUS includes private and commercial trucks registered (or licensed) in the United States as of July 1, 2002. In addition to larger trucks, includes pickups, vans, mini-vans, sport utility vehicles, and station wagons built on truck chasis. The VIUS excludes vehicles owned by federal, State, and local governments; ambulances; buses; motor homes; farm tractors; unpowered trailer units; and trucks reported to have been disposed of prior to January 1, 2002.

[2] Trucks used in "Personal Transportation" are vehicles operated for personal use, such as travel to work, carpooling, pleasure driving, etc.

[3] Vehicles not in use. When the respondent had partial-year ownership of the vehicle, annual miles were adjusted to reflect miles traveled when not owned by the respondent.

Source: U.S. Department of Commerce, Bureau of the Census, Vehicle Inventory and Use Survey (VIUS), 2002, *Report EC02TV-US, Table 2a.*

Trucks and Congestion

Commercial truck travel doubled over the past two decades. On one-fifth of the mileage of the Interstate Highway System, trucks account for more than 30 percent of all vehicles. As indicated in the Highway Travel section in Chapter 2, the growth in truck travel has been exceeding the growth in passenger travel over time, suggesting that the percentage of trucks in the traffic stream is likely to grow substantially if current trends continue.

Because of their size and operating characteristics, trucks have a greater effect than personal vehicles on traffic flow and highway level of service. Trucks take up more physical space on the roadway and do not accelerate, brake, or maneuver as well as passenger vehicles. These effects vary according to several factors, including type of highway, grades, and lane width.

Exhibit 14-2

Freight Shipments by Tons and Value

Mode	Tons [a] (Millions)			Value [a] (Billion $)		
	1998	2010	2020	1998	2010	2020
Total	**15,271**	**21,376**	**25,848**	**9,312**	**18,339**	**29,954**
Domestic						
Air	9	18	26	545	1,308	2,246
Highway	10,439	14,930	18,130	6,656	12,746	20,241
Rail	1,954	2,528	2,894	530	848	1,230
Water	1,082	1,345	1,487	146	250	358
Total, Domestic	**13,484**	**18,820**	**22,537**	**7,876**	**15,152**	**24,075**
International						
Air	9	16	24	530	1,182	2,259
Highway	419	733	1,069	772	1,724	3,131
Rail	358	518	699	116	248	432
Water	136	199	260	17	34	57
Other [b]	864	1,090	1,259	NA	NA	NA
Total, International	**1,787**	**2,556**	**3,311**	**1,436**	**3,187**	**5,879**

Key: NA = Not available.

[a] Modal numbers may not add to totals due to rounding.

[b] Other includes international shipments that moved via pipeline or by an unspecified mode.

Source: DOT Federal Highway Administration (FHWA), Freight Analysis Framework, 2002.

Trucks contribute significantly to congestion in urban centers. According to a 2004 FHWA report, *Traffic Congestion and Reliability: Linking Solutions to Problems,* trucks account for at least one-fifth of the delay for all vehicles in the 50 worst urban bottlenecks in the Nation. Oak Ridge National Laboratory, in its 2004 study, *Temporary Losses of Highway Capacity and Impacts on Performance: Phase 2*, reported that, on city streets in crowded business districts, pickup and delivery vehicles cause nearly a million hours of vehicle delay each year to other traffic as they stop to serve office buildings and retail establishments.

Freight bottlenecks on highways are not limited to urban areas. A 2005 FHWA assessment, *An Initial Assessment of Freight Bottlenecks on Highways,* located and estimated truck hours of delay for 2,110 truck bottlenecks throughout the United States. These bottlenecks caused more than 243 million hours of delay to truckers annually, at a cost of about $7.8 billion per year.

Intermodal Connectors

In addition to congestion in urban areas and on intercity highways, many trucks have to navigate small intermodal connectors between major terminals and intercity highways. A 2000 FHWA report to Congress on the condition and performance of intermodal connectors found that many of these roads are under maintained. Highway connectors to ports had twice the percentage of mileage with pavement deficiencies as non-interstate routes on the National Highway System. Connectors to rail terminals had 50 percent more mileage in the deficient category that non-Interstate routes. Connectors to airport and pipeline terminals appeared to be in better condition. Supplemental analysis conducted since the release of the 2000 report indicated that approximately one-third of the connector system is in need of additional capacity.

SAFETEA-LU did not specifically address intermodal connectors. It did, however, provide $30 million for six projects aimed at relieving congestion into and out of ports and expanding intermodal facilities and inland freight distribution centers.

Of the four major types of bottlenecks analyzed, 227 highway interchange bottlenecks on freeways serving as urban freight corridors account for the most truck hours of delay, estimated at about 124 million hours annually in 2004. The direct user cost associated with interchange bottlenecks is about $4 billion per year. Other types of bottlenecks include 859 steep grades (66 million hours of delay), 517 signalized intersections (43 million hours of delay), and 507 lane drops (11 million hours of delay).

The top 10 highway-interchange bottlenecks each cause an average of 1.5 million truck hours of delay annually. Of the 227 highway-interchange bottlenecks, 173 cause more than 250,000 truck hours of delay annually. By comparison, only a few dozen of all other truck bottlenecks cause more than 250,000 truck hours of delay annually. For example, of the identified highway truck bottlenecks, only 12 steep-grade bottlenecks, one lane-drop bottleneck, and two signalized intersection bottlenecks accounted for more than 250,000 truck hours of delay.

Over the next 20 years, congestion is expected to continue to spread beyond urban centers, and trucking will contribute to this expansion. By 2020, more than 25,000 miles of highway are likely to carry over 5,000 commodity-carrying trucks each day. Roughly one-fifth of that mileage will be significantly congested.

Trucks and Safety

Truck crashes are a major contributor to delay and a source of public concern with highway safety. The DOT National Highway Traffic Safety Administration (NHTSA) reported in its *Transportation Safety Fact Sheets 2004: Large Trucks* that, in 2004, 416,000 trucks with gross vehicle weight ratings greater than 10,000 pounds were involved in traffic crashes in the United States. Of this total, 4,862 were involved in fatal crashes. A total of 5,190 people died, and another 116,000 were injured in truck crashes.

The NHTSA also found that truck occupants accounted for only 15 percent of those who died in crashes involving a large truck. The majority of the fatalities in these crashes were occupants of another vehicle (77 percent). The remaining 8 percent were pedestrians or bicyclists. Truck tractors pulling semi-trailers accounted for 74 percent of the trucks involved in fatal crashes and approximately 52 percent of the trucks involved in nonfatal crashes.

Incidents involving hazardous materials account for a very small share of total fatalities and injuries involving trucks. In 2003 (the latest year for which data are available), trucks involved in fatal and nonfatal crashes while carrying hazardous materials were 4 percent and 2 percent, respectively, according to the Federal Motor Carrier Safety Administration's *2003 Large Truck Crash Overview*. Hazardous material was released from the cargo compartment in 13 percent of these crashes.

Trucks and Physical Condition

Truck traffic is a major source of physical wear for the Nation's highways. According to the *2002 Vehicle Inventory and Use Survey,* 102,000 trucks with typical operating weights at or above 80,000 pounds drove 4.9 billion miles. The wear and damage to the highways caused by heavy vehicles is a frequent topic of highway cost allocation studies. The FHWA's *1997 Federal Highway Cost Allocation Study* found that trucks were responsible for 40 percent of FHWA program costs, while accounting for less than 10 percent of total vehicle miles traveled (VMT).

Q&A

How is freight transportation performance measured?

As demand for freight services grows, concerns intensify about capacity shortfalls and congestion. Understanding and improving freight flows is becoming a high priority among decisionmakers at all levels of government and in the private sector. An important step in understanding the issues and challenges is to measure the performance of freight transportation. The FHWA's Office of Freight Management and Operations, in partnership with the America Transportation Research Institute and others, sponsors the Freight Performance Measurement initiative to develop performance measures for key freight corridors and U.S. international land-border crossings. This project supports DOT's strategic goals of mobility and global connectivity.

The initiative uses automatic vehicle location (AVL) and mapping technologies to determine average truck speeds and travel time reliability for "freight-significant" highway corridors. Changes in speed and reliability over time can be used to assist in the identification of freight bottlenecks (temporal and infrastructure) and areas along corridors that are the most congested. As of January 2006, one year of data are available for five freight-significant corridors (I-5, I-I-10, I-45, I-65 and I-70). Data collection began in April 2006 on an additional 20 corridors for a total of 25 freight-significant corridors. The 25 Interstates are among the Nation's most significant freight corridors in terms of average daily truck traffic, covering approximately 32,000 miles of highways and representing about 88 percent of commodity-carrying truck vehicle-miles traveled.

Recognizing that delays at U.S. international land-border crossings result in significant economic costs to the freight industry, FHWA's freight performance initiative also includes a component focused on measuring border delay and wait times. The border effort, which started in July 2005, also uses AVL and mapping technologies to examine the performance of the transportation network at five U.S.-Canada border crossings (Ambassador Bridge, Champlain, Peace Arch, Pacific Highway, and Pembina). One year of border data will be available in August 2006.

Results of the freight performance measurement initiative can be used at the national level to guide the development of future freight policies and programs and as a tool for programming and allocating resources. Transportation planners and other professionals could use this information to identify areas in need of improvements and to prioritize future projects.

Additional information on the Freight Performance Measurement initiative is available at www.ops.fhwa.dot.gov/freight/freight_analysis/perform_meas.htm.

Consequences of Highway Performance for Trucking and the Economy

Transportation is a key element of the U.S. economy. The for-hire transportation and warehousing sector alone contributed $333 billion to U.S. gross domestic product and employed approximately 4.3 million people in 2004, according to the U.S. Department of Commerce, Bureau of Economic Analysis's *Industry Economic Accounts* and the U.S. Department of Labor, Bureau of Labor Statistics's *National Employment Hours and Earnings*.

Trucking is a significant component of the cost of doing business in the United States. According to the *2002 Transportation Statistics Annual Report* by the Bureau of Transportation Statistics, trucking costs account for over 7 cents of every dollar of output in the construction industry; over 6 cents in agriculture, forestry and fisheries; about 4 cents in wholesale trade; and about 2 cents in manufacturing and services. In most of these industries, the contribution of in-house trucking is larger than for-hire trucking.

Highway congestion affects motorists, freight carriers, and freight shippers. Shippers are affected through an increase in logistics costs made up of transportation costs, inventory costs, and order costs (involving the size and frequency of an order of goods). Slower and more unreliable transportation increases transportation costs directly, but also increases order costs and inventory costs.

In Shirley and Winston's "Firm Inventory Behavior and the Returns from Highway Infrastructure Investments" (*Journal of Urban Economics, 55* (2004), 298-415) the authors estimate that because of congestion, each 10 percent increase in VMT produces at least a $1 billion increase in annual logistics costs. They note that this is a conservative estimate because it assumes a uniform increase in traffic during all hours of the day and all days of the week, instead of a more realistic assumption of sharper increases during peak periods.

Freight and SAFETEA-LU

The Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) expands or creates several programs to improve freight mobility, economic productivity, and global connectivity. SAFETEA-LU authorizes $4.615 billion for several freight-oriented infrastructure investments: Projects of National and Regional Significance, the National Corridor Infrastructure Improvement Program, the Coordinated Border Infrastructure Program, the Freight Intermodal Distribution Pilot Grant Program, and the Truck Parking Facilities Program.

SAFETEA-LU also expands the array of innovative financing options available for financing freight projects. These programs are described in more detail in Chapter 13.

Major Freight Investment Programs in SAFETEA-LU

Projects of National/Regional Significance—$1.779 billion over 5 years

National Corridor Infrastructure Improvement—$1.948 billion over 5 years

Coordinated Border Infrastructure Program—$0.833 billion over 5 years

Freight Intermodal Distribution Pilot Grant Program—$0.030 billion over 5 years

Truck Parking—$0.025 billion over 4 years

Total: $4.615 billion

Innovative Financing

SAFETEA-LU expands eligibility for financing freight projects under the Transportation Infrastructure Finance and Innovation Act (TIFIA) Program to include (1) public freight rail facilities, (2) private freight rail facilities that provide benefit to highway users, (3) intermodal freight transfer facilities, and (4) intelligent transportation systems (ITS). The law also reduces the threshold required for total project cost to $50 million ($15 million for projects related to ITS) and allows for the grouping of smaller related projects. SAFETEA-LU authorizes $610 million for the TIFIA program.

The State Infrastructure Bank (SIB) Program is another source of funding for freight projects. The SIB program enables States to increase the efficiency of their transportation investments by leveraging Federal resources to attract non-Federal public and private investment dollars. SAFETEA-LU extends this program to all States. SIB funds may be used for capital projects, credit insurance, purchase and lease agreements, and interest rate subsidization.

SAFETEA-LU also modifies the tax code to encourage private activity bonds. This provision is intended to encourage $15 billion in investment in freight facilities.

Research and Training

Beyond concrete and steel, SAFETEA-LU also provides support for research, training, and education in freight planning to strengthen decisionmaking capacity at States and local agencies. The act provides $3.5 million over 4 years for FHWA's established Freight Professional Development Program to support targeted training and technical assistance to States and localities. SAFETEA-LU also establishes the National Cooperative Freight Transportation Research Program and studies on rail transportation and regulation and the efficiency of motor carriers.

Framework for a National Freight Policy

To bring together public and private stakeholders around a common vision, the U.S. Department of Transportation has drafted a Framework for a National Freight Policy. The framework lays out a vision and objectives, then details strategies and tactics that the Department and its partners—both public and private—can pursue to achieve those objectives. The Department is actively seeking input and buy-in from the broader freight sector, including public and private sector interests.

The draft Framework is posted at:

http://ostpxweb.dot.gov/freight_policy_framework.html.